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AGRICULTURAL.

AN ADDRESS
BY HORACE GREELY,
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[CONTINUED.]

Here, then, experience has been outstripped by science, whose torch irradiates the future with light drawn directly from the present, not reflected from the past. Experience has shown that a particular rotation is preferable to the growth of the same plant on the same soil for a succession of years; but Science forecasts beyond this, and affirms that any possible rotation must be preferable to incessant and unchanging repetition, for reasons which lie deep in the bosom of nature and are inseperable from her very vitality. As surely as experience has demonstrated the expediency of keeping cattle where they have grass and water both, instead of shutting up a part where they will have grass enough but no water, and the residue where they will have abundance of water but no grass or other food, so clearly does science demonstrate the advantage of growing different crops in rotation.

But in answering our first question,—"Why should 'different crops be grown in rotation?" Science has thrown open a wide field of profitable inquiry. We have seen that five good crops of Indian corn cannot be grown off the same ground for five successive years, unless by virtue of profuse and expensive manuring; because each crop has absorbed an undue proportion of certain elements or properties essential to corn. Saving others, less vital to maize, but more necessary to wheat, clover, &c., undisturbed in the soil. We now know, therefore, that any average soil, regarded with reference to any particular plant, possesses certain elements in excess, while it is deficient in others; and we demand of science that she tell us just how we may most cheeply and easily supply, not elements of fertility in general, but those particular elements which are deficient, considered with reference to our purpose. We desire not to spend our time and means in filling a soil on which wheat is never to be grown with costly elements which wheat alone will require or take up, but to invest each dollar and day, so far as we may, in enriching that soil with the elements wherein it is now deficient, but which our next crop will nevertheless require. In other words, since it is not our practice to plow, plant and cultivate our entire farms,—forests, ravines and all,—because we purpose to harvest Indian corn and wheat from a small part of them,—so we desire to exercise a like discrimination and practice a like economy in the production or purchase and application of manures. And to do this, we appeal to science for an analysis of the different soils of our various fields, to determine wherein each is deficient, each relatively redundant, that we may apply various fertilizers accordingly. And this is the basis, and *all* the basis, of science farming.

Let me linger still on this topic of book-farming, and pile illustration on illustration of its true character and manifold advantages. You may tell me that this is needless, but I know better; since I know there are tens of thousands of farmers in every quarter—nay, right here in Indiana—some of them, I doubt not, now before me—who take no Agricultural paper—nay, no paper at all!—because they think they can't *afford it!*—that it has no other than a speculative or fancy value for their use—that they would be the poorer for taking it! Now I maintain that no farmer or artisan that can read can really afford to do without at least three weekly newspapers—one to bring him the general news, politics and social movements of his time; another to teach him whatever of discovery, invention or improvement may from time to time be made in his own pursuits or calling; and the third to keep him advised of whatever of interest may transpire in his own locality or county. He may be so very poor and inefficient that he is justified in obtaining two of these by exchanges with his equally luckless neighbors; but these three he should at least read every week, because he cannot afford to be without the intelligence they bring him. And, while there are thousands who are bringing up sons for farmers and daughters for housewives without taking a periodical or even owning a book that treats of farming or Housewifery, it is absurd to say that this stupid prejudice against book-farming has been already sufficiently dealt with since it is this day so potent and mischievous. Bear with me, then, while I attempt to let in some daylight upon it through the relation of a few homely facts:

I was visiting some old friends in Vermont last summer, when I observed in the garden of them the most thrifty and luxuriant grape-vine that I had ever seen growing in so cold a climate. Now it is one advantage possessed by the class of ignorant cultivators to which I belong over that sort who not merely know nothing but glory in it, that we are not at all reluctant to confess our ignorance when we see a chance of thus mitigating it. I, therefore, at once asked the lady whose vine this was, to tell me by what means she had insured it such vigor and productiveness; and she replied that she had made it her rule, ever since the vine was set there, to throw a pail-full of soap-suds at its root at the close of every washing-day. Again: in the same garden, I remarked a scar or ring around each plum-tree, just above the ground, and, on inquiry, ascertained that these trees had been girdled last spring by some malicious scoundrel, who had halted one dark night, on his way from the gutter to the state prison, to perpetrate this dastardly outrage. The owner discovered the mischief early next morning, and, having a pot of copal varnish in the house, speedily applied it with a brush to the wound on each tree, covering each with a coat of varnish; and by this means every tree was saved. When I saw them in midsummer, they were as green and thrifty as any trees within miles. Now I do not stand here to maintain that soap-suds will *always* insure an abundance of fine grapes, nor that a coating of vanish, seasonably applied, will *always* save girdled trees; for I do not know such to be fact. I trust further experience and inquiry will cast light on both points—that soap-suds will be withheld from the door-yard and given to the grape-vines; and that every tree that any prowling rascal may gingle will be promptly coated with vanish—until we shall determine under what circumstances, and with what limitations, potash or soda is beneficial to grapes and varnish an antidote for girdling. The point I make is this, that no sane farmer, having heard this relation, will henceforth throw away his soap-suds or neglect varnishing his girdled trees, unles he learns some reason for doing otherwise; and that, if he would do so on the strength of my mere narration, he ought many times rather to do so had he found these sane receipts in an Agricultural paper or manual, where the chances are ten to one that it would not have found a place unless on the strength of testimony more reliable than mine, because founded on a wider and more varied experience, and subjected to a more rigid scrutiny.

Take another case: My friend Dr. R. T. Underhill was a physician in extensive practice some twenty years ago, when, in the prime of life, having beeome heartily tired of gallipots and bone-sawing, he shook off the dust of our city from his feet, and resolved henceforth to live an honest life as a grower of fruits. He went forty miles up the Hudson, bought a neck of land, and commenced the cultivation of the Grape, which he has since prosecuted with scientific knowledge, untiring energy, and at length with decided success. He has probably assuaged more suffering with his grapes than he ever created by his drugs; he has grown considerably younger by his twenty years' farming, and is now taking his place among the most brisk and genial of our youth—an admirable specimen of that branch of "Young 'America" which does not hate to work nor long for an opportunity to steal.

"Well: the doctor, since the untimely death of the lamented Downing, stands, probably, at the head of our fruit-growers, with whom one knotty problem of the last few years has been—how to counteract the ravages of the curculio, which is nearly robbing us of plums, for which his taste is equal to ours, while in the matter of gratifying it he is decidedly ahead of us. By the time he has taken his quota, the plums left on a tree, or score of trees, are not worth gathering. But Dr. Underhill, by long sturdy and careful observation, has discovered the means of completely outwitting him. He has found, by watching and noting her movements, that the female curculio will not deposit her eggs where they, when the plums containing them drop, will fall into water, her instinct teaching her that they will thus be drowned. Taking advantage of this instinct, the doctor plants his plum-trees on the bank of a stream or pond, and gives the trunks such an inclination that all their branches overhang the water. Thus the desolater is checkmated by his own instinct, and the fruit preserved from his ravages. I know nothing cleverer in its way than this device.

Now I suppose there is no contemner of 'Book-farming' so mulish or so dull that he would not, after hearing of this device, take advantage of any brook or pond he might have on his premises, and set his plum-trees where they will be safe from the curculio. But suppose the discovery had been made by some fruit-grower of the last century, and duly recorded in a book, had since been subjected to a thousand ordeals, and had passed triumphant through them all—would it have been less acceptable or less valuable than it now is? If it be worth our while to learn at all, what difference can be imagined between the knowledge founded on a neighbor's experience and that contained in a book? If there be any, are not the odds altogether in favor of that prescription which has undergone the wider scrutiny and been subjected to the more rigorous criticism?

And here let me speak of another, who more recently shook off the dust of our City's pavements to spend the later half of his life on a farm. I allude to Professor James J. Mapes, whose fame as an Agriculturist must have reached very many among you. It cannot be many years—it seems to me but five er six—since Prof. Mapes, who was extensively engaged in sugar-refining and had heavy dealings in sugar—came to a dead halt, or rather a dead smash. Stripped of means and of credit, he felt too old to launch again on the dangerous sea of commerce, whose waves had so lately and so deeply engulphed him; so he hired a bit of land in New-Jersey, removed his family thither, and resolved to turn the chemical and other scientific knowledge which had so little availed him as a sugar-refiner, to account in the novel vocation of a farmer.—He was very destitute, and of course got on but slowly at first; and when he first undertook to lecture in illustration of farming as a science, I well remember how very general was the predjudice and derision he encountered. But he persevered both in farming and lecturing; and he has gtoriously succeeded. I presume there were many errors in his earlier inculcation; there may be some yet, for he is a genius, and genius is too apt to leap hastily to sweeping conclusions from inadequate premises. But, whatever his faults the root of the matter was in him, and his career has proved it. As a lecturer, an editor, and as a practical farmer, he is enriching the vocation he has chosen and by no means impoverishing himself. Beginning with nothing, he cannot have cleared less than $20,000 in the last six years, and his income must now be at least $5,000 per annum. And this is not all made by merely talking and writing about farming, but in good part by actual work. For example: He last year bought ten acres of naturally good but exhausted and weedy land adjoining him for $250 per acre, pulverized and fertilized it thoroughly to the depth of two feet, planted it with cabbages as close together as they could grow, and by the sale of his first crop paid for the manure, labor and land, having the latter all clear at the year's end, and in far better condition than when he bought.—Can any enemy of 'book-farming' beat this? Or is there any of them who would not like to know exactly how this land was fertilized and tilled, even though he should be obliged to read it in a book or periodical?

Let me next illustrate the importance and advantages of the careful Analysis of Soils:

A friend bought, one year ago, a small farm which had previously been uuder decent or ordinary cultivation, but which, it appears, had been for many years mainly fertilized with Gypsum or Plaster of Paris—an excellent thing in its place, and which had doubtless done the land good service. But the new farmer's brother is a thorough Chemist, devoting much attention to Agriculture; and he was invited to analyze the soil of this farm with a view to its prospectivs and economical improvement. Careful analysis showed a signal deficiency of lime, but a superabundance of sulphur and other ingredients of plaster. Of course, at each successive application of plaster the plants took up the lime only, leaving all the residue to lie inert in the soil; and so the old farmer had for years been feeding his soil, at the rate of twenty to thirty cents per bushel, with the requisite lime brought from a distance in the form of plaster, while there was far better lime burned all around him, and for sale in abundance at six cents a bushel! The less thus incurred may have averaged fifty dollars per annum—all for want of an analysis that might have cost ten to twenty dollars. And there are tens of thousand to-day farming just as blindly as did this old farmer.

Can there be any rational wonder that farmers seldom grow rich by such farming? How is a wise and judicious economy of means to be attained if ignoranee and waste are to reap the rewards properly due only to intelligence and frugality? If I were to buy paper and other materials used in my basiness as carelessly and blindly as this old farmer bought manures and fertilized his land, I could not continue to print papers for a single year. Wiser, more prudent, more intelligent publishers, would undersell and supplant me, and I must fail and be driven into some vocation where ignorance, heedlessness and unthrift secure the rewards designed by providence for intelligence, industry and economy.

But let us pause at that word Industry. "By Industry we thrive," is an old saw, which is very well in its place; but the truth contained in proverbs is so curtly expressed that it often misleads more than it directs. Industry is indeed essential to thrift, and farmers, like other men, often need to be reminded of it. When I note one who is overwhelmed with "business," which calls him away from home two or three days in each week, and keeps him hanging about the tavern or store while his boys are at play and his potatoes crying for the hoe, I know whither *that* farmer is tending, and can guess about how long he will have any land to mismanage. And I think that, in the average, farmers waste more hours than machines. They have more idle time—not necessarily, but quite commonly so regarded—through bad weather, severe cold, too much wet, &c. than falls to the lot of almost any other class; and it is very easy to allure many of them away to shoot at other men's turkies when they should be growing food for their own. But while many waste precious hours, quite as much through heedlessness and want of system as indolence, I know another class who slave themselves out of comfort and out of thought by incessant, excessive drugery,—who are so absorbed in obtaining the means of living that they never find time to live—who drive throug the day so that their bones and their minds are foggy at night; and are so overworked through the week that they can neither worship God nor enjoy the society of their families on the Sabbath. These men will often tell you they have *no time to read*, which is just as rational as for the captain of a steamship to plead a want of time to consult his compass and chart or keep a reckoning of his ship's progress. No time to read! do they not find time to plant and sow, to reap and mow, and even to eat and sleep? If they do, then they may find time, if they will, to learn how to apply their labor to the best advantage as well as to qualify themselves by rest and refreshment for working at all. I venture the assertion that there are twenty thousand farmers in Indiana who would have been wealthier as well as more useful, more respected and happier men this day, if they had abstracted ten hours per week from labor during all their adult life, and devoted those hours to reading and thought, in part with a view to improvement in their own vocation, but in part also looking to higher and nobler ends than even this.—Some men waste the better part of their lives in dissipation and idleness; but this does not excuse in others the waste of time equally precious in mere animal effort to heap up goods and comforts which we must leave behind so soon and forever.

—I can read very few old books—I can hardly find time to master the best new ones; but I have no doubt that those who *do* read the very oldest treasties on Agriculture which have survived the ravages of time, will find Cato, or Seneca, or Columella, or whoever may be the author in hand, talking to the farmers of his day very much as our farmers are now generally talked to, and inculcating substantially the same truths: "Plow deeper, fertilize more thoroughly, cultivate less land, and cultivate it better"—such, I have no doubt, has been the burden of Agricultural admonition and exhortation from the days of Homer and Moses. It seems increditable to modern skepticism that millions of Hebrews could have for ages inhabited the narrow and rocky land of Judea; and it *would* be hard to believe, if we were ignorant of the Agrarian law of Moses, under which, as popolation increased, the inalienable patrimony of each family became smaller and smaller, and and the cultivation of course better and better. Very few of us are at all aware of the capacity of an arable acre, if subjected to thorough scientific culture.—Many a family of four or five persons has derived a generous subsistence for year after year from a single acre. The story of a farmer who was compelled to sell off half his little estate of eight or ten acres, and was most agreeably surprised by finding the reward of his labor, quite as large when it was restricted to the remaining half as when it was bestowed on the whole was very current in Roman literature two thousand years ago. Why is it that men persist in rnnning over much land, instead of thoroughly cultating a little, defying not only Science, but Experience, the wisdom of the fireside as well as that of the laboratory, can only be accounted for by supposing that men have a natural passion for annexation, a pride in extended dominion, or else a natural repugnance to following good advice. Surely, if wisdom ever cried in the streets, she has been bawling herself hoarse these twenty five centures against the folly of maintaining fences and paying taxes on a hundred acres of land in order to grow a crop that might have been produced from ten.

But the sinners against light and knowledge in our day have far less excuse than their remote ancestors, or even their own grandfathers. It was always well to urge deep plowing and the like; but so long as the plow was but a forked log or stick, with one prong sharpened for a coulter, and the other employed as a beam, it was hardly possible to plow thoroughly. In our day, however, the advance from wooden plows through iron points and iron mold-boards, to iron plows, steel points, steel plows, and subsoiling, has been so signal and dicisive that the shiftless creature who with his two lean ponies skims and skins over the fields he ought either to cultivate or let alone,—scratching their surface mildly to a depth of three or four inches,—sins against such an array of light and knowledge that he is far less excusable than his ancestors who did not pretend to plow at all, but stuck in a seed here and there as the could easiest find a hole or make one, and trusted to Providence to give them an undeserved return for their spiritless and frivolous efforts.

The three main features of Agricultural advancement among the Anglo-Saxon race now a-days are: 1. deep plowing, or Sub-Soiling; 2. Draining; 3. Irrigation. I am quite aware that draining should take precedence in the order of time, yet I believe, in point of fact, deep plowing has led to draining, by demonstrating its necessity, and not draining to deep plowing. We suffer immensely from drouth in this country. Probably the aggregate annual loss from drouth alone throughout the Union decidedly exceeds, taking one year with another, the entire cost of our Federal Government. Yet we know that the roots of most plants will descend to moisture, no matter how dry the surface, if the earth beneath them is porous, mellow and inviting. Hence we realize the importance of deep plowing; and, after doubling our teams and sinking our deepest plows to the beam, we summon to our aid the sub-soil implement, and go down a depth beyond that of a single furrow.—But we soon find that the pulverization of the sub-soil, thus attained, has no permanent effect; that the water that leaches down to it settles it into a compact, solid mass, which the roots cannot perforate; and all our sub-soilling needs to be done over again. The remedy that readily suggests itself is the freeing of the sub-soil from water by drains sunk below it, three to six rods apart. and filled half-way up with pebbles, with flat stone forming a sort of culvert, or, still better, laid with draining-tile or hollow brick, placed end to end, and forming a continuous channel from the highest part of any slope or grade to the brook which drains it. And now the sub-soil, supposing the drains well made and the drainageway sufficient, is readily freed from any water settling into it, and long retains the porous and permeable character communicated to it by deep plowing.

Of course, this does not exhaust the good effects of draining. The sub-soil, thus loosened and freed from excessive moisture, becomes a source of food as well as brink to the plants growing above it; for that it is capable of feeding plants, no one, who has observed the rank vegetation growing out of the earth thrown up by draining or digging, can doubt. Instead of being like a slough in wet weather and like a brick in dry, the sub-soil retains sufficient moisture to cheer the plants but too little to indurate itself. And the mean temperature of the soil, hitherto lowered by the constant evaporation of the water contained in the sub-soil, is raised several degrees by the sun's rays, no longer counteracted by the evaporating process,—at least, not to any such extent as before—so that the plants grow more luxuriantly, mature more rapidly, and so are earlier out of danger from frost. And beside this, the constant passage of currents of air through that portion of the drain not occupied by water,—and each drain should have an opening at its head as well as its mouth—is an additional source of fertility through the chemical combination it insures. It would be difficult to overstate the value, the importance, the profit of draining.

Many are accustomed to say, "This land needs no "draining;" means that it is not habitually to wet. But draining proves as useful, if it is not as imperatively necessary, on dry soils as on wet.—On dry lands it is required that the sub-soil, once broken up and pulverized, shall not, by the settling of moisture therein during the wet season, be hardened and rendered impervious again; these lands need to be rendered porous and penetrable by roots to a greater depth *because* of their dryness; they need to be shielded from the pernicious of constant evaporation in cooling the soil, and thus retarding the growth of its plants. There is very much land not worth tilling; but there is none that will justify tillage which would not reward draining.

Of Irrigation, we in this country know very little by experience; but we are destined soon to know more, and to be profited by our knowledge. True, there are lands that may be readily drained and sub-soiled that cannot so readily be irrigated, owing to their elevation and a deffcient supply of water. I apprehend however, that those lands are not to be found in Indiana, nor in any other Prairie State, whose first peculiarities that strike a stranger are a superabundance of water in the rainy season and a scarcity thereof in the dry. The time is at hand when you here require extensive and powerful pumping apparatus, if only to raise water for your heavy stocks of cattle and convey it to the pastures wherein they will be confined; and why not raise enough of the grateful fluid to refresh pastures and cattle alike?

But even though this assured and ample resource were non-existent, I maintain that water enough falls on your fields every year, to keep them luxuriant through the summer, if it were saved and not wasted. But most of it falls during the seasons when least is wanted, and is suffered to run off to the rivers and the ocean, carry very much of the best juices of the soil along with it, when it should be retained in ponds and reservoirs to be pumped into barn-yards or drawn off to irrigate the fields during the fervid heats of summer. The apparent difficulty of doing this would vanish and the presumed expense be materially lessened on careful consideration.

I know not that I have traversed any country with more lively interest than beautiful, bountiful, picturesque Lombardy. The dark pall of Austrian despotism enveloping it did not suffice to dim its natural loveliness and luxuriance, so greatly improved by the labor and genius of Man. It seems to have grown into its system of almost universal irrigation by imperceptible and unmarked degrees, and to be now producing double harvests annually as the result of some fortuitous impulse rather than of foresight and deliberate calculation. The magnificent plain of Upper Italy, which has for so many centuries been the field of combat where Goth and Latin, Frank and Hun, Gaul and German, have struggled for the mastery of Europe, slopes almost imperceptibly from the Alps to the Po, and the impetuous torrents which tear the rocky sides of the snow-crowned precipices are arrested aud chastened in the blue Lakes which lie at the foot of the mountains, smiling serenely out upon the plain.

Thence the waters proceed with a more gentle and measured cadence to the great river, and are drawn off and stayed from point to point to fill the irrigating canals and ensure a rich reward to the husbandman's labors. Let any stream from heavy rains become a raging, foaming, milky torrent, and its waters have a value which the pure element could not command, and are drown off on every side until the canals and reservoirs are filled and all danger of inundation precluded. Thus the waters are most valuable for irrigation just when they are most easily and abundantly obtainable for that purpose. The water which has irrigated one fertile garden or field, far from being exhausted, has been rendered more nourishing thereby, and may now be drawn off to fertilize the next field lying an inch or so lower, and thence to the next, and so on, unreservedly, to the river, enriching and gladdening all it touches on its way. Irrigation is the life-blood of Lombardy; shall it be nothing, teach nothing, to us?

If there be a country on earth which one would suppose irrigation unsuited to, Great Britain is that country. Her exceedingly moist, cool climate, coupled with her compact, day subsoil (not universal, but very extensive) would seem to render a deficiency of moisture one of the very last evils to be apprehended or guarded against in her Agriculture. And yet her best farmers are now embarking rapidly and extensively in Irrigation, finding it practicable and immensely profitable.—Not here, as in Lombardy, is the natural flow of the streams, in their descent from the hills to the rivers, relied on; but great pumps are employed, raising water by steam or other power from rivers, brooks and ponds, to a hight whence it is carried by gravitation through metallic and gutta-percha pipes to every point where it is needed. Mr. Mechi, the ex-London merchant, who retired from trade with a competency to earn another by scientific farming, takes the lead in this application, and his estimates of the increased productiveness of lands by reason of irrigation and the profits thus secured would seem wild to any audience unfamiliar with the subject. I may state, however, that he fixes the expense of conveying his manures in a liquid form from his yard to every portion of his estate as equivalent to one penny sterling or two cents per cart-load—that is to say, the fertilizing properties which were contained in a tun of muck or compost are now conveyed to the soil that requires them at the cost of one penny. That loading, teaming, unloading and spreading in the old way must have cost far more than this, you cannot doubt; and beside, the fertilizing liquid, being free from seeds or weedy germs of any kind, and in a condition to be readily and totally absorbed by plants, must be worth twice as much as if applied in the old way. Now consider that this load of manure has been conveyed through and applied with many tuns of water, just when the soil is most thirsty, and the plants most needy, and you can readily judge that the tun of manure dissolved in water and applied through irrigating pipes at the cost of a penny, must be worth at least thrice as much as the same tun applied in the crude, solid state, at a cost of not less than thrice that sum.—But I must not dwell on details. You have the general idea, and can follow it out at your leisure into all its necessary results.

III. What the sister arts teach as to Agriculture may be fairly summed up in this proposition:

The workman should be completely master of his materials and his implements. He should first thoroughly understand, in order that he may in the next place thoroughly control, the elements from which he is to evolve value and sustenance. He who should undertake to build a ship, in ignorance of the relative tenacity and resistance to pressure of the various woods and metals, would rush into a pursuit for which he had no capacity; so would he who should undertake the running of a steam-engine in ignorance of the nature and power of steam. Yet the man who attempts to farm with an imperfect knowledge of the nature and properties of soils in general, of the laws of Vegetation, the qualities and peculiarties of the particular soils whereof his farm is composed, and the cheapest means of renovating and increasing their fertility and productiveness, stands on the same platform with the ignorant shipwright or engineer, and braves like disasters, whereof the largest share will naturally fall to himself and his family. Agriculture is a pursuit so vast in its scope, so various in its processes and objects, that it is difficult to lay down a general rule with regard to it that will admit of no exceptions; yet I will venture to propound one, which is as follows: The cultivator whose farm is not more valuable and more productive as one results of each year's tillage, does not understand his vocation, and ought to learn it or quit it.

Perhaps there is no single field of observation wherein the extent and disastrous effects of ignorance among farmers more strikingly exhibited than in that of Insect Life and Ravages. It has pleased the All-wise to subject Agriculture to the chances and perils of insect depredations, as well as to weeds, drouth, frost, inundation, and other evils. The end of all these is beneficence—the evolution and discipline of man's capacities through the necessary counteraction and combat.—Plants and domestic animals rightfullly look to owner for efficient protection; and and he who allows his sheep to be killed by wolves, his fowls to be carried off by insects, is culpably faithless to his dependents and its duty. Yet how listlessly, thoughtlessly, hopelessly, do we see farmers stand by while their crops are destroyed by worms, birds, or weevil, without seeming to know that they have anything to do in the premises? No Turkish fatalism is blinder or blanker than theirs. It is hardly yet six weeks since I saw whole countries of my own State covered and devastated by grasshoppers, who stripped the dry uplands of every blade of grass, almost every green leaf, cutting the green oats from their stalks, the fruit from the trees, devouring corn in the ear, making the cleared a desert, and pushing the cattle to the very verge of starvation. Yet there stood the farmers, gazing gloomily from day to day at the destruction of their cherished hopes of a harvest and the utter desolation of the whole country, yet not one asking of another, "What shall we do to arrest this sweeping ravage? How shall we most readily, cheaply and surely clear our lands of these vermin?" I do not pretend to know what the proper remedy was or is; but I *do* know, that, had *I* been one of these farmers, I would have found a remedy or bankrupted myself in the search. I should have first interrogated the best authorities on Agriculture and Natural History, and, in case of finding no guidance there, I should have sowed one acre of my land bountifully with Salt; the next with plaster; the next perhaps with Nitre; a fourth with potash; and so on, using in all cases substances that I knew would be paid for by future harvests, unless I had reason to believe something else would be more efficient. Thus; before one week had elasped, I would have found some caustic that grasshoppers could not abide; and having found it, I would have applied it, till the last cormorant among them had been driven into the woods or turned over on his back. And this is the spirit in which such invasion should be met and and overcome. Had the farmers of any township promptly met, when the ravage first became serious and agreed that one of them would try one possible antidote and another, according as they happened respectively to have the material at command, and meet a few evenings later to compare notes on the rerults of their several experiments, they could not have failed to discover an efficient remedy within the first week. But they did nothing; and hence many of their farms are a desert, their fall crops next to nothing, and half there cattle must be sold for want of food.

Our farmers generally think and work better out of their own vocation than in it. A distant and towering evil arouses their hostility and evokes their energy much more readily than one of a less imposing but more mischievous character which assails them in their homes. Let the word go forth, "An army of invaders have landed!" and tens of thousands snatch instinctively their muskets and take the road; but here are armies all around them who are plundering them who are plundering them worse than any invader would, yet hardly attract their notice. The Hessians who were hired to to subjugate our fathers had no rest for their feet until the last of them was killed captured or hunted home, more than seventy years ago; yet their attendant parasite, the Hessian Fly, has been plundering us ever since without resistance, and is now as formidable and destructive as ever. I cannot believe flies more difficult to conquer than men, if we would but fairly set about it.

IV. And here let me retrace my steps to illustrate a point in Industrial Economy which I have already incidentally touched but have not illustrated as its importance deserves and as the prevailing misconceptions render necessary. I refer to The Proportion of Means to Ends, which the Artisan must always bear in mind but which the Farmer seems too often to forget. No artificer presumes that the labor and meterial required for a fine table will suffice for a piano-forte; nor that a steam-engine can be constructed as cheaply as a churn. But the farmer, seeing trees and plants, grow around him with weed-like facility and tenacity, often indolently imagines that *any* tree will grow so, and plants his rare and delicate fruit-trees, if he plant such at all, as if they were oaks and locusts. But nature is inexorable in her requirement that the labor and care essential to the production of a choice fruit or plant shall be proportionate to the product. You may grow pine on yellow sand or hickory on blue clay; but if you want choice pears or peaches you must devote much labor and expense to preparing and enriching the ground wherein your trees are to be set. Too many farmers, not heeding this law, or supposing that nature may somehow be circumvented, obtain worthless fruit or none at all, and so abandon the culture in disgust and despair.

There is not now one grape-vine or fruit tree, except of the coarsest and commonest kinds, where there should be twenty, taking one State with another; and one

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